original research report

The incidence rate of prostate cancer in Saudi Arabia: an observational descriptive epidemiological analysis of data from the Saudi Cancer Registry 2001–2008

Ibrahim G Alghamidi [a,*], Issam I Hussain [a], Mohamed S Alghamdi [b], Mohammed A El-Sheemy [a,c]

[a] University of Lincoln, Brayford Pool, Lincoln LN6 7TS, UK, [b] Ministry of Health, General Directorate of Health Affairs, Al-Baha, Saudi Arabia, [c] Lincoln Hospital, Research and Development United, Lincolnshire Hospitals NHS Trust, Lincoln LN2 5QY, UK

[*] Corresponding author. Address: University of Lincoln, School of Life Sciences, Brayford Pool, Lincoln LN6 7TS, UK. Tel.: +44 1162761913, mobile: +44 7547672538. bio-stat@hotmail.com, · 12365333@students.lincoln.ac.uk · Accepted for publication 16 October 2013

Hematol Oncol Stem Cell Ther 2014; 7(1): 18–26

DOI: http://dx.doi.org/10.1016/j.hemonc.2013.10.001

BACKGROUND: This study presents descriptive epidemiological data related to prostate cancer cases diagnosed from 2001 to 2008 among Saudi men, including the frequency and percentage of cases, the crude incidence rate (CIR) and the age-standardised incidence rate (ASIR) adjusted by region and year of diagnosis.
METHODS: This is a retrospective descriptive epidemiological analysis of all Saudi prostate cancer cases recorded in the Saudi Cancer Registry (SCR) between January 2001 and December 2008. Statistical analyses were conducted using descriptive statistics, the Poisson regression model, a simple linear regression model and analysis of variance with the Statistical Package for the Social Sciences version 20.0 (SPSS).
RESULTS: A total of 1739 cases were registered in the SCR between January 2001 and December 2008. The eastern region of Saudi Arabia had the highest overall ASIR at 10.1 per 100,000 men, followed by Riyadh at 7.1 and Makkah at 5.2, while Jizan and Najran had the lowest average ASIRs at 1.4 and at 2.0, respectively. The Poisson regression model for the region of Jizan shows that the incidence rate ratio (IRR) was significantly higher ($p < 0.001$); for the regions of Riyadh at 3.43 times (95% CI, 3.13–3.73), followed by Makkah at 2.56 (95% CI, 2.38–2.74) and the eastern province at 1.93 (95% CI, 1.64–2.23). The annual prediction of the CIR of prostate cancer in Saudi Arabia could be defined by the equation $1.53 + (0.094 \times \text{Years})$, and the prediction of the ASIR could be defined by the equation $2.98 + (0.182 \times \text{Years})$.
CONCLUSION: There was a steady increase in the CIRs and ASIRs for prostate cancer between 2001 and 2008. The eastern region, Riyadh and Makkah had the highest overall ASIR in Saudi Arabia. Further effective screening programmes and active treatment measures are needed to control prostate cancer disease among Saudi men.

Prostate cancer is one of the most common cancers among men, and it is the sixth leading cause of cancer-related mortality in men worldwide.[1–4] It has become a significant health problem in both developed and developing countries.[2,4] The incidence rate of prostate cancer differs from country to country, and the proportion of cases vary by more than 25-fold globally.[5] According to the American Cancer Society, in 2008 an estimated 903,500 new cases of prostate cancer were reported among men internationally, while the number of deaths was 258,400.[4,5]

Prostate cancer is the second leading cause of death among men in the United States,[1] and will influence one in six males during their life span. In 2013, it is estimated that 238,590 new cases will be detected and 29,720 men will die from prostate cancer.[6] The burden of prostate cancer has increased in Europe, with an estimated 379,000 new cases and 94,000 deaths reported in 2008.[7] In addition, mortality rates continue to increase in African people, and decrease in the Asian population.[4,7]

In Saudi Arabia, the International Agency for Research on Cancer (IARC) estimated that the

age-standardised incidence rate (ASIR) for prostate cancer was 7.7 per 100,000 men in 2008, and the age-standardised mortality rate (ASMR) was 5.1 per 100,000 men.[7] Furthermore, the registry of the King Faisal Specialist Hospital and Research Centre (2011) recorded 1213 cases (1.7%) of prostate cancer admitted to the hospital during the years 1975–2011.[8] In 2008, the Saudi Cancer Registry (SCR) reported that prostate cancer ranked sixth in cancer incidence among Saudi men.[9]

The age standardized incidence rate of prostate cancer in Saudi Arabia is very low in comparison to Arab Gulf and European countries. For example, in 2008, the reported ASIRs for Qatar, Bahrain, Kuwait, and United Arab Emirates were higher than Saudi Arabia at 15, 13.3, 11.6 and 9.6, respectively.[7] Despite lacking information about prostate cancer in Saudi Arabia, except for the SCR reports, we have attempted to study the incidence of prostate cancer in different regions of Saudi Arabia during the years 2001–2008. The objectives of this study are to investigate and describe the distribution of prostate cancer in terms of the characteristics of person, place and time among Saudi men.[10]

MATERIALS AND METHODS

We conducted a retrospective descriptive epidemiological study of all Saudi men prostate cancer cases diagnosed between January 2001 and December 2008. Data for cancer in Saudi Arabia are publicly available and easily accessible. The data sources for this study were made possible by the SCR, a population-based registry established in 1994 by the Ministry of Health in Saudi Arabia. The data cannot be obtained directly from the SCR, except through published reports. There were no available data from 1994 to 2000, and the latest published report of the SCR was in 2008. Other cancer reports have been published by the King Faisal Specialist Hospital and Research Center, which is a hospital-based registry. We were therefore unable to use them for a general analysis of the Saudi male population.

Since its establishment, the SCR has been providing reports on the pattern of cancer in Saudi Arabia with a primary objective of defining the population-based incidence of the disease. Based on these data, there are currently comprehensive reports for 13 administrative regions from 2001 to 2008 that outline the frequency and percentage of cases, the CIR and the ASIR adjusted by the provinces of Saudi Arabia and the year of diagnosis for each case. This study was conducted using these reports from the Saudi Cancer Registry with the aim of presenting the descriptive epidemiology of prostate cancer in Saudi Arabia.

Table 1. Segi (World) standard: For making comparisons with intermediate-age population (Segi, 1960). It can be used in direct method of standardization to calculate the ASIR & ASMR.

Age group	Segi (World) standard
0–4	12,000
5–9	10,000
10–14	9000
15–19	9000
20–24	8000
25–29	8000
30–34	6000
35–39	6000
40–44	6000
45–49	6000
50–54	5000
55–59	4000
60–64	4000
65–69	3000
70–74	2000
75+	2000
Total	100,000

For data analysis, we used the Statistical Package for the Social Sciences version 20.0 (SPSS). The descriptive analysis of the epidemiological data was performed by calculating the overall percentage, the CIR and the ASIR adjusted by the age group, region and year of diagnosis. The percentage was calculated by adding the number of prostate cancer cases and then dividing that number by the total number of male cancer cases. Furthermore, analysis of variance test (ANOVA) was performed to determine any significant differences among the regions and years of diagnosis.[11] In addition, the linear regression model that investigates the strength of the association between independent variables and an outcome was applied to predict the annual CIR and the ASIR for prostate cancer among Saudi men.[12] In addition, the Poisson regression model was conducted to calculate the incidence rate ratio of prostate cancer cases in each region of Saudi Arabia.

The overall age-standardised rates per 100,000 men were calculated for all of Saudi cancer registry reports based on the world standard of Segi (1960) for populations who have an intermediate-age population (Table 1). This is a particularly important rate when making comparisons between different populations with respect to the age structure.[13,14]

RESULTS

A total of 1739 cases were recorded in the SCR between January 2001 and December 2008. The frequency of prostate cancer cases increased slightly from 2001 to 2008. Figure 1a and b show 156 cases (5.4%, 95% CI, 3.5% to 7.3%). This figure rose to 176 cases in 2002, representing an increase of 0.5%. In 2005, 261 cases were reported, corresponding to a 1.6% increase. This was the highest figure reported by the SCR (2005). However, the figure dropped from 2005 to 2008 by 0.7%.

The average number and percentage of prostate cancer cases between 2001 and 2008 adjusted by age group, was calculated from the SCR (Table 2) and (Figure 1c and d). The age groups reported correspond to 00–44, 45–59, 60–74, and over 75 years. According to the overall numbers and percentages, the age groups that recorded the highest affected by prostate cancer were men aged 60–74 years, with 111 cases, representing 50.7% of the total number of prostate cancer cases, followed by those over 75 years, with 80 cases, representing 37.5%. The younger group aged 00–44 years recorded the lowest overall number and percentage with two cases, representing less than 1% of the total number of prostate cancer cases, followed by men aged 45–59 years with 24 cases, representing 10.8%.

The CIRs adjusted by year of diagnosis from 2001 to 2008 per 100,000 men indicate a steady increase of prostate cancer among men in Saudi Arabia. According to Table 3 and Figure 2a, a CIR of 1.9

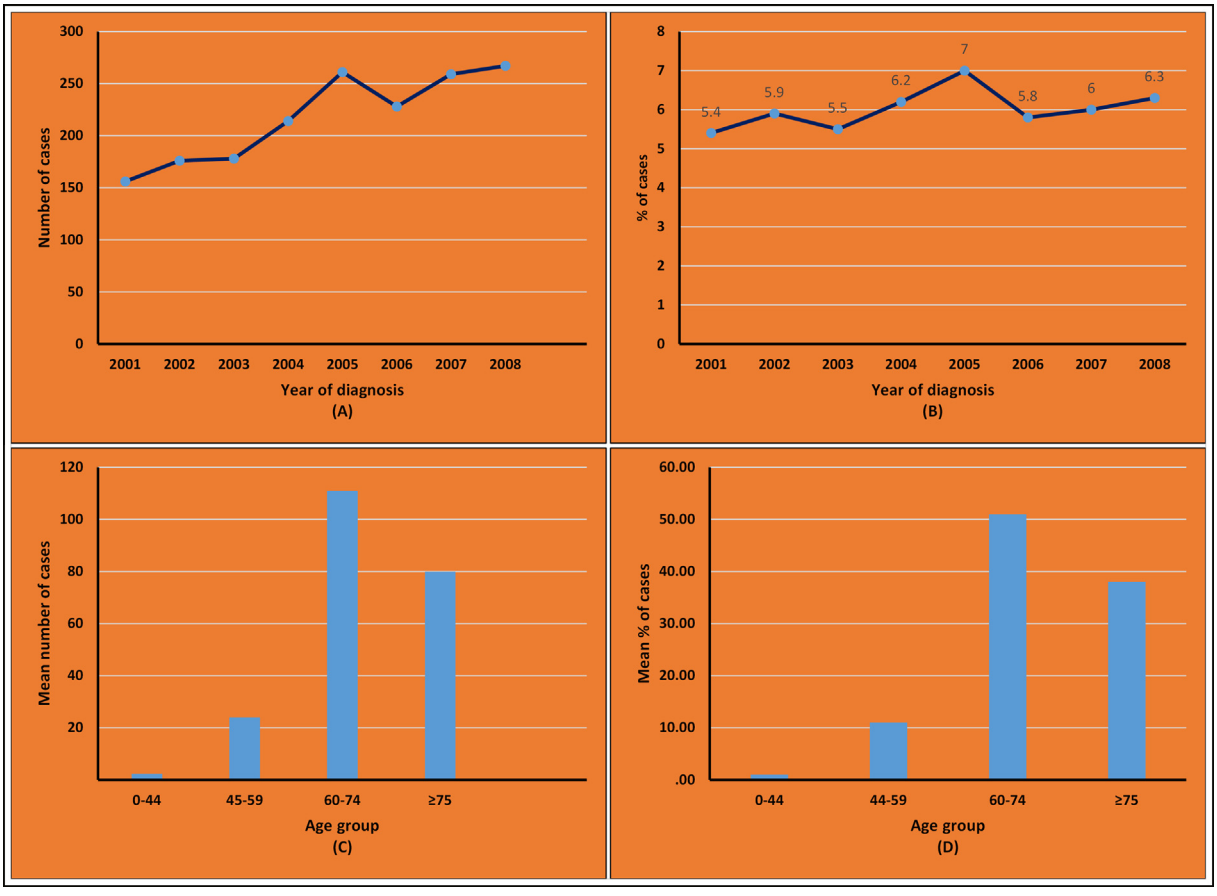

Figure 1. (A and B) Number and percentage of prostate cancer cases in Saudi Arabia from 2001 to 2008. (C and D) Overall number and percentage of prostate cancer case distribution by age group in Saudi Arabia from 2001 to 2008.

Table 2. Prostate cancer cases distribution by age group in Saudi Arabia from 2001 to 2008.

Year	Age Group												
	0–44		45–59		60–74		≥75		Total		Median age	Range of age	
	No	%	No	%	No	%	No	%	Total	%	Year	Minimum year	Maximum year
2001	1	0.6	12	7.4	65	42.0	78	50	**156**	**5.4**	72	44	94
2002	1	0.5	17	10.0	92	52.0	66	37.5	**176**	**5.9**	72	43	98
2003	4	2.2	16	9.0	95	53.4	63	35.4	**178**	**5.5**	72	44	98
2004	2	1.0	26	12.0	109	51.0	77	36.0	**214**	**6.2**	71	25	107
2005	2	1.0	23	9.0	149	57.0	87	33.0	**261**	**7.0**	71	6	103
2006	2	1.0	30	13.0	103	45.0	93	41.0	**228**	**5.8**	71	1	101
2007	3	1.0	40	15.0	137	53.0	79	31.0	**259**	**6.0**	70	10	100
2008	3	1.0	30	11.0	138	52.0	96	36.0	**267**	**6.3**	70	41	107
Average	**2**	**1.0**	**24**	**11.0**	**111**	**51.0**	**80**	**38.0**	**217**	**6.0**	**71**	**27**	**101**

There are no significant differences between years of diagnosis p-value > 0.05.

Table 3. Confidence Interval for%, CIR and ASIR of prostate cancer cases in Saudi Arabia from 2001 to 2008.

Year	Percentage			CIR per 100,000			ASIR per 100,000		
	%	95% CI Lower	95% CI Upper	CIR	95% CI Lower	95% CI Upper	ASIR	95% CI Lower	95% CI Upper
2001	**5.4**	3.5	7.3	**1.9**	1.4	2.4	**3.4**	2.1	4.8
2002	**5.9**	4.4	7.4	**2.3**	1.6	3.0	**4.0**	2.1	5.9
2003	**5.5**	3.6	7.4	**2.2**	1.6	2.9	**4.2**	2.4	6.0
2004	**6.2**	4.5	7.9	**2.6**	1.9	3.3	**5.1**	3.6	6.7
2005	**7.0**	5.3	8.7	**3.1**	2.3	3.9	**6.2**	4.5	7.9
2006	**5.8**	4.6	7.0	**2.6**	1.9	3.3	**6.1**	4.6	7.6
2007	**6.0**	3.9	8.1	**2.9**	2.0	3.8	**5.7**	3.5	7.9
2008	**6.3**	4.3	8.4	**2.9**	2.1	3.7	**5.7**	4.0	7.4
Overall	**6.0**	**4.2**	**7.8**	**2.6**	**1.9**	**3.3**	**5.1**	**3.3**	**6.8**

(95% CI, 1.4 to 2.4) per 100,000 men was estimated in 2001, and a CIR of 2.9 (95% CI, 2.1 to 3.7) per 100,000 men was estimated in 2008. In 2005, the CIR of 3.1 (95% CI, 2.3 to 3.9) per 100,000 men was the highest rate, but was not statistically significant compared to the other years: $F(7, 96) = 0.76$, $p > 0.05$. However, this figure dropped by 0.2% in 2008. Based on the linear regression model, the equation for a straight line to predict the annual CIR of prostate cancer in Saudi Arabia is $1.53 + (0.094 \times \text{Years})$, and the incidence rate of prostate cancer increased by a predicted average of 0.094 per 100,000 Saudi men per year.

The overall CIR of prostate cancer adjusted by the regions of Saudi Arabia from 2001 to 2008 per 100,000 men was calculated from the SCR, as shown in Table 4 and Figure 2b The eastern region of Saudi Arabia had the highest overall CIR for prostate cancer at 3.5 (95% CI, 3.1 to 3.9) per 100,000 men, followed by Riyadh at 3.0 (95% CI, 2.6 to 3.5) and Makkah at

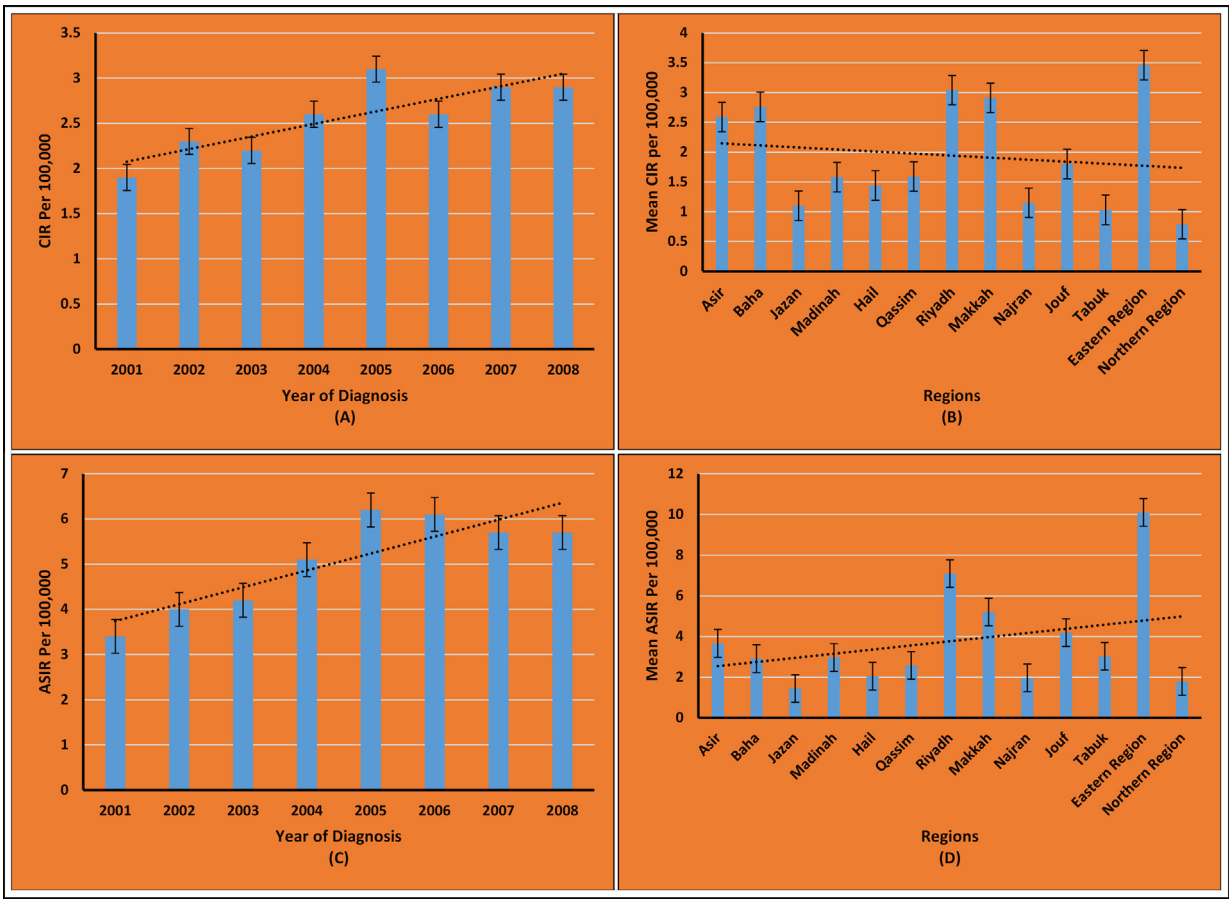

Figure 2. (A) The crude incidence rate of prostate cancer cases in Saudi Arabia from 2001 to 2008. (B) Overall crude incidence rate of prostate cancer cases distribution by region in Saudi Arabia from 2001 to 2008. (C) The age-standardised incidence rate of prostate cancer cases in Saudi Arabia from 2001 to 2008. (D) Overall age-standardised incidence rate of prostate cancer case distribution by region in Saudi Arabia from 2001 to 2008.

2.9 (95% CI, 2.2 to 3.7). Therefore, the analysis of variance test revealed that the incidence rates of prostate cancer were significantly higher for these regions compared to other parts of Saudi Arabia: $F(12, 91) = 8.483$, $p < 0.001$. Furthermore, Jizan (95% CI, 0.8 to 1.4), and Najran (95% CI, 0.4 to 1.9) had the lowest average CIRs for prostate cancer among Saudi men at 1.1 and 1.2, respectively. However, the figures for these regions were generally in agreement with increasing or decreasing ASIR.

The world age-standardised incidence rate of prostate cancer per 100,000 men, adjusted for the region and the year of diagnosis, suggests a similar trend to that seen for the CIR from 2001 to 2008 (Figure 2c and d). There was a slight increase in the cases of prostate cancer diagnosed between 2001 and 2008, with the highest ASIR of 6.2 reported in 2005 (95% CI, 4.5 to 7.9), followed by a slight decrease in the ASIR to 5.7 in 2008 (95% CI, 4.0 to 7.4), according to reports released by the SCR. However, the equation for the straight line to predict the annual ASIR of prostate cancer in Saudi Arabia is $2.97 + (0.182 \times \text{Years})$, and the ASIR of prostate cancer increased by a predicted average of 0.182 per 100,000 Saudi men per year. Similarly, the eastern part of Saudi Arabia had the highest mean ASIR at 10.1 (95% CI, 8.6 to 11.6), followed by Riyadh at 7.1 (95% CI, 5.7 to 8.5) and Makkah at 5.2 (95% CI, 3.9 to 6.6). Therefore, the analysis of variance was statistically significant for these regions compared to other provinces of Saudi Arabia: $F(12, 91) = 18.693$, $p < 0.001$. Jizan (95% CI, 0.7 to 2.2) and Najran (95% CI, 0.7 to 3.2) had the lowest mean ASIRs at 1.4 and 2.0, respectively.

The Poisson regression model was conducted to calculate the incidence rate ratio (IRR) of prostate cancer cases in different regions of Saudi Arabia. The model was statistically significant: LR χ^2

Table 4. Confidence Interval for overall%, CIR and ASIR of prostate cancer cases in the regions of Saudi Arabia from 2001 to 2008.

Regions	Overall percentage			Overall CIR			Overall ASIR		
	%	95% CI Lower	95% CI Upper	CIR	95% CI Lower	95% CI Upper	ASIR	95% CI Lower	95% CI Upper
Asir	**7.0**	5.0	9.1	**2.6**	1.8	3.4	**3.7**	2.5	4.9
Baha	**8.3**	4.8	11.8	**2.8**	1.5	4.0	**2.9**	1.5	4.3
Jizan	**4.8**	3.3	6.2	**1.1**	0.8	1.4	**1.4**	0.7	2.2
Madinah	**4.5**	3.0	6.0	**1.6**	1.0	2.2	**3.0**	2.2	3.7
Hail	**4.6**	1.4	7.8	**1.4**	0.5	2.3	**2.1**	0.4	3.7
Qassim	**4.3**	3.0	5.5	**1.6**	1.2	2.0	**2.6**	1.8	3.4
Riyadh	**6.0**	5.3	6.7	**3.0**	2.6	3.5	**7.1**	5.7	8.5
Makkah	**6.1**	5.0	7.2	**2.9**	2.2	3.7	**5.2**	3.9	6.6
Najran	**3.9**	1.1	6.6	**1.2**	0.4	1.9	**2.0**	0.7	3.2
Jouf	**5.7**	2.9	8.5	**1.8**	1.0	2.6	**4.2**	2.2	6.2
Tabuk	**2.8**	1.7	3.9	**1.0**	0.6	1.4	**3.0**	1.6	4.4
Eastern Region	**7.7**	6.9	8.5	**3.5**	3.1	3.9	**10.1**	8.6	11.6
Northern Region	**5.5**	3.6	7.3	**2.0**	1.4	2.7	**3.9**	2.6	5.2

Table 5. Poisson regression model to calculate the IRR and check if there is an effect due to geographical area, year of diagnosis, CIR and ASIR.

No cases	Incidence rate ratio	*P*-value	95% CI
Regions			
1. Asir	0.31	0.14	(0.22–0.40)
2. Baha	0.25	0.12	(0.15–0.35)
3. Jizan	1 Reference	1	
4. Madinah	0.56	0.20	(0.44–0.68)
5. Hail	0.19	0.08	(0.11–0.27)
6. Qassim	0.38	0.15	(0.26–0.51)
7. Riyadh	**3.43**	**0.001***	(3.13–3.73)
8. Makkah	**2.56**	**0.001***	(2.38–2.74)
9. Najran	**0.11**	**0.001***	(0.06–0.17)
10. Jouf	0.16	0.06	(0.11–0.22)
11. Tabuk	0.20	0.09	(0.14–0.26)
12. Eastern Region	**1.93**	**0.001***	(1.64–2.23)
13. Northern Region	**0.06**	**0.001***	(0.02–0.11)
Years	**1.0**	**0.002***	(0.99–1.04)
CIR	**1.5**	**0.001***	(1.40–1.66)
ASIR	0.98	0.39	(0.96–1.11)

(*) means the significance level is <0.05. When the *P*-value is less than 0.05, the result is statistically significant.

Table 6. The differences in the percentage, CIR and ASIR of prostate cancer cases in the regions of Saudi Arabia between 2001 and 2008.

Regions	Percentage%				CIR per 100,000				ASIR per 100,000			
	2008	2001	difference	*P*-value	2008	2001	difference	*P*-value	2008	2001	difference	*P*-value
Asir	6.9	7.5	**−.60**	**0.88**	2.6	2.1	**.5**	**0.81**	3.6	2.9	**.7**	**0.87**
Baha	16.1	7.7	**8.4**	**0.02***	5.6	1.4	**4.2**	**0.03***	6.3	2.2	**4.1**	**0.04***
Jizan	3.1	4.8	**−1.7**	**0.54**	0.8	1.2	**−.4**	**0.77**	1.1	0.7	**.4**	**0.77**
Madinah	5.2	7.5	**−2.3**	**0.52**	2.4	2.0	**.4**	**0.84**	4.1	3.3	**.8**	**0.77**
Hail	4.3	11.7	**−7.4**	**0.06**	1.7	3.1	**−1.4**	**0.52**	1.9	6	**−4.1**	**0.14**
Qassim	4.1	2.3	**1.8**	**0.48**	1.5	1.4	**.1**	**0.96**	2.6	2.3	**.3**	**0.89**
Riyadh	7.0	4.9	**2.1**	**0.54**	3.9	2.6	**1.3**	**0.61**	9.4	5.4	**4.0**	**0.29**
Makkah	5.7	3.7	**2.0**	**0.51**	2.8	1.3	**1.5**	**0.45**	5.0	2.2	**2.8**	**0.29**
Najran	3.4	3.6	**−.20**	**0.94**	1.0	1.2	**−.2**	**0.89**	2.2	1.6	**.6**	**0.67**
Jouf	4.5	5.6	**−1.1**	**0.73**	1.8	1.3	**.5**	**0.77**	4.6	2.8	**1.8**	**0.51**
Tabuk	3.9	2.8	**1.1**	**0.67**	1.5	1.0	**.5**	**0.75**	4.9	3.0	**1.9**	**0.51**
Eastern Region	7.4	7.6	**−.20**	**0.96**	3.7	3.0	**.7**	**0.78**	10.5	8.2	**2.3**	**0.59**
Northern Region	8.0	10.0	**−2.0**	**0.63**	3.1	0.7	**2.4**	**0.21**	5.7	3.9	**1.8**	**0.56**

(15) = 600.3, $p < 0.001$. According to Table 5, Jizan was the reference region for making comparisons between other provinces of Saudi Arabia; the IRRs were significantly higher ($p < 0.001$), for the regions of Riyadh at 3.43 times (95% CI, 3.13–3.73), followed by Makkah at 2.56 (95% CI, 2.38–2.74) and the eastern region at 1.93 (95% CI, 1.64–2.23). Furthermore, the percentage change in the IRR of prostate cancer cases was significantly higher with an increase of 1% for every unit increase in one year and 1.5% for every unit increase in CIR.

The differences in the CIR and the ASIR between 2001 and 2008 were calculated from the data in the SCR to investigate the pattern of prostate cancer among older Saudi men in different regions (Table 6). The greatest changes in percentages were observed only in the region of Baha (16.1%, 4.2 CIR, 4.1 ASIR). However, the CIR and ASIR for all regions, with the exception of Baha, are still under the predicted values based on the equations for the linear regression: $1.53 + (0.094 \times 8 \text{ Years} = 2.28)$ per 100,000 men for the CIR and $2.97 + (0.184 \times 8 \text{ Years} = 4.44)$ per 100,000 men for the ASIR. The smallest changes in CIR and ASIR were detected in the regions of Hail (−7.4%, −1.4 CIR, −4.1 ASIR), and Jizan (−1.7%, −0.4 CIR, 0.4 ASIR). Therefore, these regions recorded downtrending rates from 2001 to 2008.

DISCUSSION

This is the first epidemiological study of prostate cancer in Saudi Arabia. It describes the pattern of the disease during the years 2001–2008. This study provides an important explanation for the recent trend, supporting the significance of the disease. Our results confirm that the eastern region, Riyadh and Makkah have the highest overall CIRs and ASIRs for prostate cancer among men in Saudi Arabia. In addition, the overall CIRs and ASIRs in these regions increased above the expected levels of 2.25 per 100,000 men for the CIR and 4.44 per 100,000 men for the ASIR during the years 2001 to 2008.

Our results also confirm that the regions of Jizan and Najran have the lowest values in the average CIR and ASIR. The age group most affected by prostate cancer in Saudi Arabia and in other developed countries is of men above 65 years of age.[15,16] Despite the extensive use of prostate specific antigen (PSA) screening for early detection of the presence of the disease in both younger and older men, incidence rates in men older than 65 years remain high.[16] However, in some clinical trial studies, PSA has proved to be a major limitation for identifying the true cases of prostate cancer, with false positive results recorded due to lack of sensitivity of the test.[17,18] Other studies have specified that the PSA screening test decreased

the mortality rate of prostate cancer by 20%, but was associated with over-diagnosis.[19,20]

In this study, we have reported the changes in the percentage, the CIR and the ASIR from 2001 to 2008. Baha had the highest differences in rates, which were above the predicted value of 2.25 per 100,000 men for the CIR during the years 2001–2008. In addition, it had the highest difference in the ASIR, and was very close to the predicted value of 4.44 per 100,000 Saudi men. These differences suggest that the region of Baha was significantly affected by prostate cancer over the eight-year period (2001–2008). However, the rates of prostate cancer decreased in the regions of Hail and Jizan over the same period. These regions had the lowest changes with down-trending in the CIR and ASIR from 2001 to 2008.

In 2008, the ASIRs and ASMRs of prostate cancer were reported in Saudi Arabia at 7.7 per 100,000 men. These were considered very low in comparison to both Arab Gulf countries and other world countries (Table 7). Ireland had the highest ASIR of prostate cancer in the world at 126.3 per 100,000 men. This figure was 16-fold higher than Saudi Arabia. However, the pattern and trend of prostate cancer should be monitored and not neglected due to low ASIR and ASMR.[7]

It is important to note that these results are useful to health researchers in Saudi Arabia for generating hypotheses about the potential risk factors of prostate cancer in the highest affected regions, and for conducting analytic epidemiologic studies that identify the relationships between exposure and disease.[13] However, the availability of data from SCR reports encourages further descriptive epidemiological studies of other types of cancers among the Saudi population.

Table 7. The ASIR and ASMR of prostate cancer across different countries of the world. Estimated by the International Agency for Research on Cancer (IARC) 2008.

Country	Age standardised incidence rate ASIR per 100,000 men	Age standardised mortality rate ASMR per 100,000 men
Ireland	126.3	13
Australia	105	15.4
USA	83.8	9.7
UK	64	13.8
Lebanon	25.4	17.7
Qatar	15	8.4
Jordan	13.9	10.2
Bahrain	13.3	5.9
Kuwait	11.6	5
UAE	9.6	4.5
Oman	9	5.6
Saudi Arabia	7.7	5.1
Egypt	6.6	5.1

CONCLUSION

It is clear from the epidemiological analysis of the reports registered by the Saudi Cancer Registry from 2001 to 2008 that the CIR and ASIR of prostate cancer are steadily increasing. The regions of Jizan and Najran had the lowest average CIRs and ASIRs, while the Poisson regression model and linear trend are a concern in certain regions, such as the eastern region, Riyadh and Makkah. As mentioned earlier, the region of Baha recorded the greatest differences of the CIR and ASIR between 2001 and 2008, while the regions of Hail and Jizan recorded the lowest. However, further effective screening programs are needed across Saudi Arabia, and active treatment measures should be implemented to control prostate cancer among Saudi men.

CONFLICT OF INTEREST

None declared

REFERENCES

1. Siegel R, Ward E, Brawley O, Jemal A. Cancer statistics, 2011: the impact of eliminating socioeconomic and racial disparities on premature cancer deaths. CA Cancer J Clin 2011;61(4): 212–36.

2. Baade PD, Youlden DR, Krnjacki LJ. International epidemiology of prostate cancer: geographical distribution and secular trends. Mol Nutr Food Res 2009;53(2):171–84.

3. Edwards BK, Brown ML, Wingo PA, Howe HL, Ward E, Ries LA, et al. Annual report to the nation on the status of cancer, 1975–2002, featuring population-based trends in cancer treatment. J Natl Cancer Inst 2005;97(19):1407–27.

4. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin 2011;61(2):69–90.

5. American Cancer Society. Global cancer facts and figures. 2nd ed. Atlanta: ACS; 2011.

6. National Cancer Institute at the National Institutes of Health. <http://www.cancer.gov/cancertopics/types/prostate>; 2013 accessed 16.05.13.

7. GLOBOCAN. Cancer Fact Sheet. International Agency for Research on Cancer; 2008. Available from: <http://globocan.iarc.fr/factsheets/cancers/all.asp>; accessed 10.06.2013.

8. King Faisal Specialist Hospital and Research Centre. Tumor Registry, Annual Report. 2011.

9. Saudi Cancer Registry. Cancer Incidence Report in Saudi Arabia. Saudi Oncology Society; 2008. Available from: <http://www.oncology.org.sa/portal/index.php?>; accessed 5.06.2013.

10. Friis RH, Sellers TA. Epidemiology for public health practice. 4th ed. Sudbury, MA: Jones and Bartlett; 2009.
11. McHugh ML. Multiple comparison analysis testing in ANOVA. Biochem Med (Zagreb) 2011;21(3):203–9.
12. Tabatabai MA, Eby WM, Li H, Bae S, Singh KP. TELBS robust linear regression method. Dovepress 2012;2:65–84.
13. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age Standardization of Rates: A New WHO Standard. GPE Discussion Paper Series: No. 31. World Health, Organization. 2001.
14. Doll R, Payne PM, Waterhouse JAH. Cancer Incidence in Five Continents. International Union Against Cancer. Springer-Verlag, Berlin. 1966.
15. Fitzpatrick JM. Management of localized prostate cancer in senior adults: the crucial role of comorbidity. BJU Int 2008;101(Suppl. 2):16–22.
16. Holliday EB, Swanson GP, Du F, Basler JW. Older men with intermediate to high risk prostate cancer–patterns of care and outcomes of treatment. J Cancer Ther 2012;3(5):575–81.
17. Cook BC. Prostate cancer diagnostics: now and in the future. MLO Med Labs Obs 2013;45(4):20–2.
18. Smith CJ. Diagnostic tests (1) – sensitivity and specificity. Phlebology 2012;27(5):250–1.
19. Rabah DM, Arafa MA. Prostate cancer screening in a Saudi population: an explanatory trial study. Prostate Cancer Prostatic Dis 2010;13(2):191–4.
20. Schröder FH, Hugosson J, Roobol MJ, Tammela TL, Ciatto S, Nelen V, et al. Screening and prostate-cancer mortality in a randomized European study. N Engl J Med 2009;360(13):1320–8.